

Appl. No. 10/783,495
Amdt. dated 07/15/2008
Response to Office action of 04/17/2008

Attorney Docket No.: N1085-00251
[TSMC2003-0834]

Claims:

This listing of pending claims in the application is as follows:

- 1 1. (Previously Presented) A method for controlling exposure energy on a patterned
2 wafer substrate, comprising the steps of:
3 controlling the exposure energy with a feedback process control signal of critical
4 dimension,
5 and further controlling the exposure energy with a feed forward process control
6 signal of a compensation amount that compensates for wafer thickness variations, by
7 combining the feed forward control signal with the feedback process control signal to
8 control the exposure energy,
9 the critical dimension being one of a width, a spacing and an opening of the
10 patterned wafer substrate.
- 1 2. (Cancelled)
- 1 3. (Original) The method of claim 1, further comprising the step of: supplying the
2 feed forward process control signal by a feed forward controller.
- 1 4. (Original) The method of claim 1, further comprising the step of: controlling the
2 exposure energy by a feed forward control signal of an interlayer thickness
3 measurement.
- 1 5. (Previously Presented) The method of claim 1, further comprising the step of:
2 controlling the exposure energy by a feed forward control signal of an interlayer
3 thickness measurement remaining after chemical mechanical planarization thereof.
- 1 6. (Original) The method of claim 1, further comprising the step of: calculating the
2 compensation amount according to a polynomial function with a coefficient of the

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3 function being based on a measurement of a remaining thickness of a planarized
4 interlayer.

1 7. (Previously Presented) The method of claim 1, further comprising the step of:
2 calculating the feedback process control signal of critical dimension measurement of a
3 top layer in a previous manufacturing lot.

1 8. (Previously Presented) The method of claim 1, further comprising the steps of:
2 calculating the compensation amount according to a polynomial function with a
3 coefficient of the function being based on a measurement of a remaining thickness of a
4 planarized interlayer; and calculating the feedback process control signal of critical
5 dimension measurement of a top layer in a previous manufacturing lot.

1 9. (Previously Presented) The method of claim 1, further comprising the step of:
2 calculating the compensation amount according to a polynomial function with higher
3 order coefficients set at zero.

1 10. (Previously Presented) The method of claim 1, further comprising the step of:
2 calculating the compensation amount according to a linear function.

1 11. (Previously Presented) The method of claim 1, further comprising the step of:
2 calculating the compensation amount according to a segmented linear function.

1 12. (Previously Presented) A system for controlling exposure energy on a first
2 patterned wafer substrate, comprising:

1 a feed forward controller providing a feed forward control signal to an exposure
2 apparatus based on a thickness measurement of an interlayer of the first patterned
3 wafer substrate for controlling the exposure energy focused on a top layer of the first
4 patterned wafer substrate, and

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5 a feedback controller providing a feedback exposure energy control signal to the
6 exposure apparatus based on critical dimension measurement of a top layer of a
7 second patterned wafer substrate of a previous manufacturing lot, the critical dimension
8 being one of a width, a spacing and an opening of the second patterned wafer
9 substrate,

10 wherein a combiner combines the feed forward control signal and the feedback
11 exposure energy control signal to produce a combined signal that is provided to the
12 exposure apparatus.

1 13. (Original) The system of claim 12, further comprising: a thickness measurement
2 device providing thickness measurement data to the feed forward controller.

1 14. (Previously Presented) The system of claim 12, further comprising: a critical
2 dimension measurement device providing critical dimension measurement data to the
3 feedback controller.

1 15. (Previously Presented) The system of claim 12, further comprising:
2 a thickness measurement device providing thickness measurement data to the
3 feed forward controller and
4 a critical dimension measurement device providing critical dimension
5 measurement data to the feedback controller.

1 16. (Previously Presented) The system of claim 12, further comprising: a thickness
2 measurement device providing thickness measurement data of a shallow trench
3 isolation layer of the first patterned wafer substrate to the feed forward controller.

1 17. (Previously Presented) The system of claim 12, further comprising: a critical
2 dimension measurement device providing critical dimension measurement data of a
3 poly-gate of wafer substrate of a previous manufacturing lot.

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- 1 18. (Previously Presented) The system of claim 12, further comprising:
2 a thickness measurement device providing thickness measurement data of a
3 shallow trench isolation layer of the first patterned wafer substrate to the feed forward
4 controller, and
5 a critical dimension measurement device providing critical dimension
6 measurement data of a poly-gate of a previous manufacturing lot.
- 1 19. (Previously Presented) The system of claim 18 wherein,
2 the feed forward controller is user configurable by having one or more polynomial
3 coefficients set to zero in a polynomial function model.
- 1 20. (Original) The system of claim 12 wherein;
2 the feed forward controller is user configurable by having one or more polynomial
3 coefficients set to zero in a polynomial function model.
- 1 21. (Previously Presented) The system of claim 20, further comprising: a thickness
2 measurement device providing thickness measurement data of a shallow trench
3 isolation layer of the first patterned wafer substrate to the feed forward controller.
- 1 22. (Previously Presented) The system of claim 20, further comprising: a critical
2 dimension measurement device providing critical dimension measurement data of a
3 poly-gate of the second patterned wafer substrates of a previous manufacturing lot.